

REMARKS/ARGUMENTS

In view of the foregoing amendments and following remarks, Applicant respectfully requests reconsideration of the rejections of Claims 1 – 19. Claims 1 and 18 have been amended to further clarify the invention. Claim 4 has been amended to recite that the membrane reformer is capable of producing hydrogen having a purity that is up as high as 99.999% pure.

All pending Claims have been rejected under 35 U.S.C. § 103(a) as being unpatentable over one or more references considered individually or in combination. U.S. Patent Publication No. 2002/0029820 to Ovshinsky et al. is the primary reference cited in all the rejections. The Examiner alleges that Ovshinsky describes a hydrogen supply system comprising a hydrogen supply station having a storage bed and meter; and a hydrogen production system. The Examiner notes that Ovshinsky fails to describe the process or components used for reforming, and cites U.S. Patent No. 5,686,196 to Singh et al. and/or U.S. Patent No. 6,908,700 to Lio for various components utilized in conventional reformers. U.S. Patent No. 5,124,140 to Okada et al. and U.S. Patent Publication No. 2002/0085963 to Vidalin were also cited by the Examiner in combination with one or more of Ovshinsky, Singh, or Lio.

To further distinguish the claimed invention, Claim 1 has been amended to recite that the hydrogen production system includes a “membrane reformer” that is capable reforming fuel and separating hydrogen from reformed fuel. The structure and features of a membrane reformer are discussed throughout the specification, for example page 13, line 23 to page 14, line 19. As discussed in the instant application, the membrane reformer is characterized in that only high purity hydrogen is extracted by providing a selective hydrogen permeation at a catalytic reaction tube in which a steam reforming reaction is performed. This provides two advantageous effects over prior art reformers: 1) the steam performing reaction is significantly accelerated; and 2) no independent purifier for the reformed gas is necessary.

As a result of these two advantages, the hydrogen production system can be made dramatically more compact. In contrast, the prior art hydrogen production systems which use steam for reforming action include a catalytic reaction tube and an independent purifier for the reformed gas. The hydrogen production system which uses the membrane reformer of the claimed invention can be made about ½ the size and about 1/3 the volume in comparison to

conventional production systems. This reduction in size permits a larger-capacity hydrogen system to be loaded onto a vehicle so that the system can be moveable. This in turn, makes it feasible to have a mobile hydrogen production system to provide hydrogen to a plurality of hydrogen stations.

Further, since the membrane reformer is made compact, a desulfurizer and a prereformer can also be loaded onto the vehicle at the same time. This permits hydrogen to be produced from both LPG and liquid oil fuel. Additionally, a CO₂ recovery unit can also be loaded onto the vehicle.

In contrast to the claimed invention, none of the cited references disclose or suggest a hydrogen supply system having a membrane reformer. In particular, the reformer unit described in Singh and Lio is structurally different than the membrane reformer recited in independent Claims 1 and 19. For example, the reformer described in Singh is not capable of both reforming and separating the hydrogen from the fuel. In addition, the system of Singh includes a separate condenser and hydrogen separator so that the overall size of the system described in Singh is significantly greater than that of the claimed invention. Similarly, Lio describes a system that includes an additional component for removing carbon monoxide from the reformat gas. Lio does not disclose or suggest a membrane reformer that is capable of both reforming and separating the reformed fuel. Ovshinsky, Okada, and Vidalin also fail to disclose or suggest a hydrogen production system comprising a membrane reformer, let-alone a membrane reformer that is capable of reforming and separating the reformed fuel. Thus, independent Claims 1 and 18, and any claims dependent thereon are patentable over the cited references.

It is respectfully submitted that the rejections under 35 U.S.C. § 103(a) have been overcome because the cited references, whether considered individually or in combination, fail to teach or suggest the claimed invention. It is therefore submitted that the pending claims are in condition for allowance.

Conclusion

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of

Appl. No.: 10/634,371
Amdt.dated 07/13/2006
Reply to Office action of 04/19/2006

this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,

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LEGAL02/4822718v1

ELECTRONICALLY FILED USING THE EFS-WEB ELECTRONIC FILING SYSTEM OF THE UNITED STATES PATENT & TRADEMARK OFFICE ON July 13, 2006.